7. [12 points] In the following we consider two linear, homogeneous, second-order, constant coefficient differential equations, for \( y(t) \) and \( z(t) \). The phase portrait for the equation for \( y(t) \) is shown to the right, and graphs of \( z(t) \) for two different initial conditions are shown in the figure to the right, below. Explain in a sentence or two why each of the following cannot be true.

a. [3 points] The equation is \( y'' - 3y' + 2y = 0 \)

b. [3 points] The general solution to the equation is \( y = c_1 e^{-t} + c_2 e^{-2t} \).

c. [3 points] Given some initial conditions, the Laplace transform \( Z(s) = L\{z(t)\} = \frac{2s+4}{s^2+2s+5} \).

d. [3 points] Written as a system, the equation for \( z(t) \) is \( \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}' = \begin{pmatrix} 0 & 1 \\ -4 & 0 \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix} \).